



TASC Review of DePue OU4 Sampling Plan

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Presentation Outline

1. Introduction to TASC
2. Risk Assessment 101
3. Lead Cleanup Goals
4. OU4 Plan

Introduction to TASC

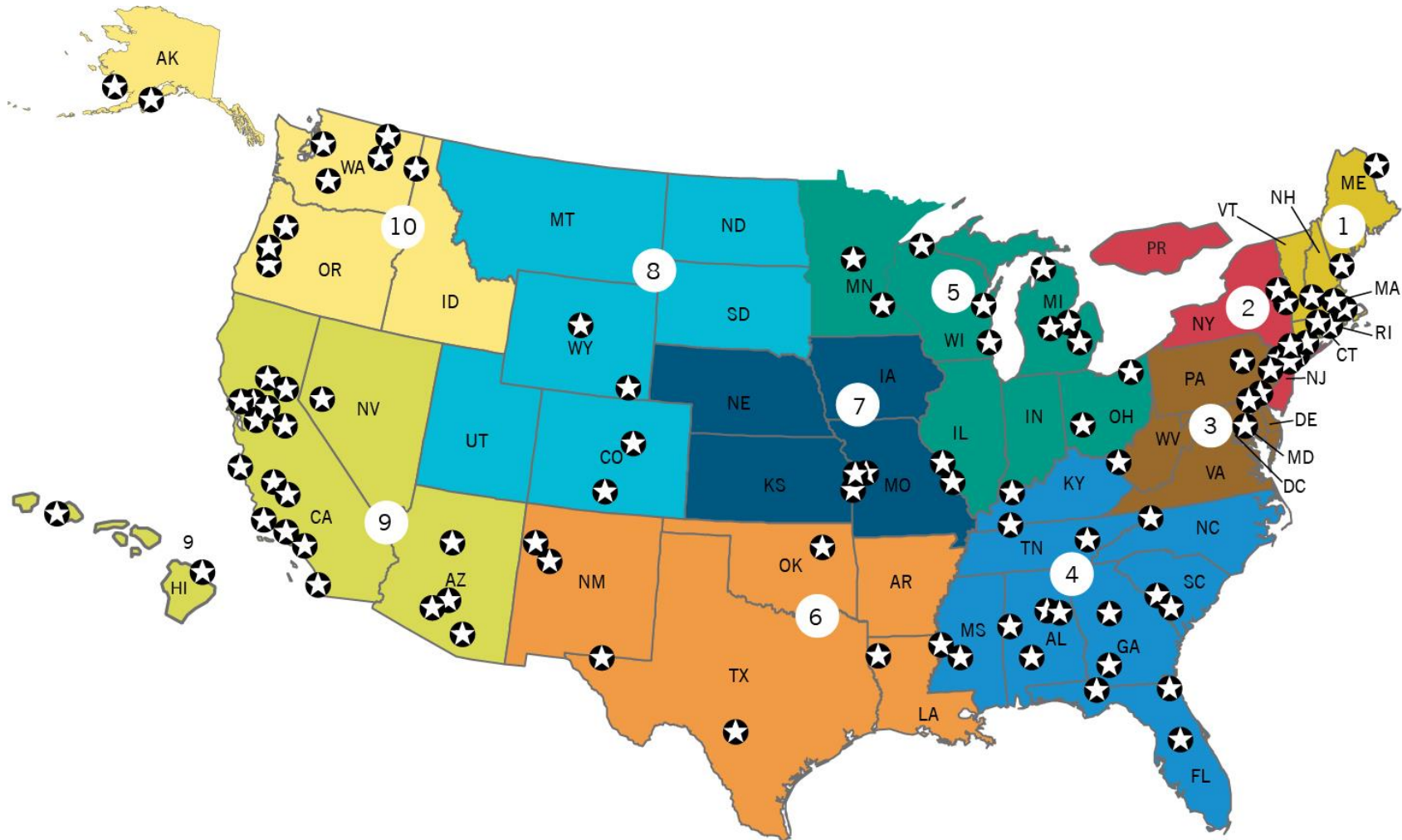


Introduction to TASC

- **Technical Assistance Services for Communities**
- EPA-sponsored program
- Independent services provided by Skeo Solutions



Introduction to TASC



Risk Assessment 101



What is Risk Assessment?

- **Risk** = chance of harmful effects to human health resulting from exposure to environmental stressor
- **Risk Assessment** = systematic approach to determine human health effects and environmental impacts associated with exposure to chemicals



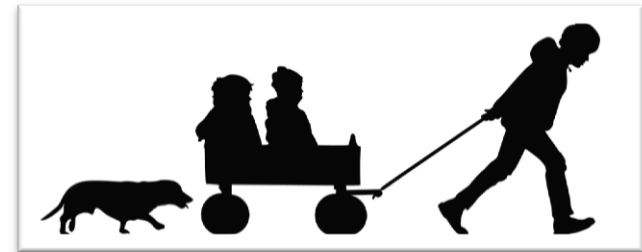
Risk Happens When ...



1. Contaminants exist
2. Concentrations are high enough



3. There is a pathway for exposure (a way for people to come into contact with contamination)



4. There are receptors (people, animals, a sensitive ecosystem)

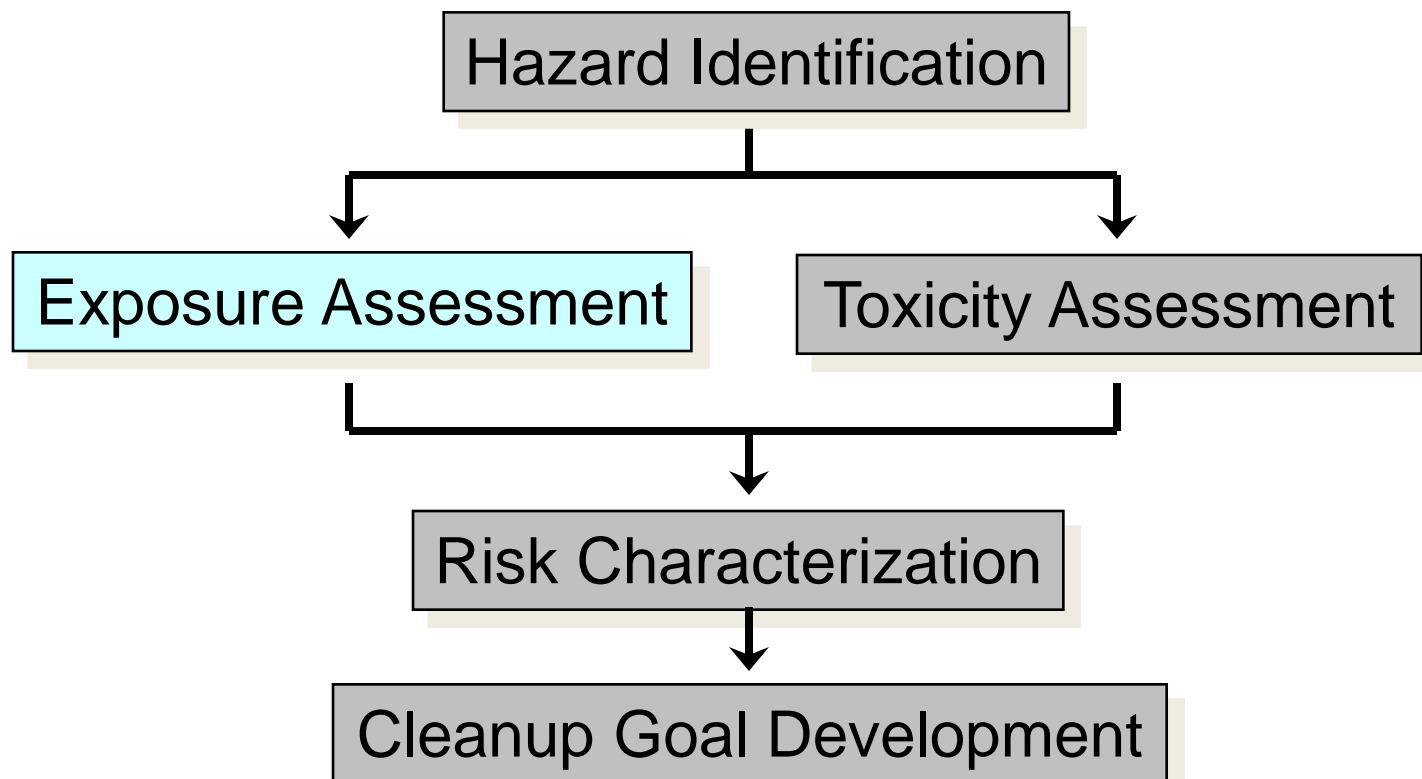


What is Risk Assessment?

- Required by CERCLA
- Basis of whether a remedy is needed to control or eliminate:
 - contaminant source
 - exposure pathway
 - receptor
- Identifies health-based cleanup levels



Risk Assessment Process





Exposure Pathways

Inhalation



Ingestion

Skin Contact



No exposure = No risk



Exposure Assessment

- Components:
 1. Identify completed exposure pathways
 2. Estimate exposure point concentrations
 3. Calculate chemical dose
- Incorporates default exposure assumptions

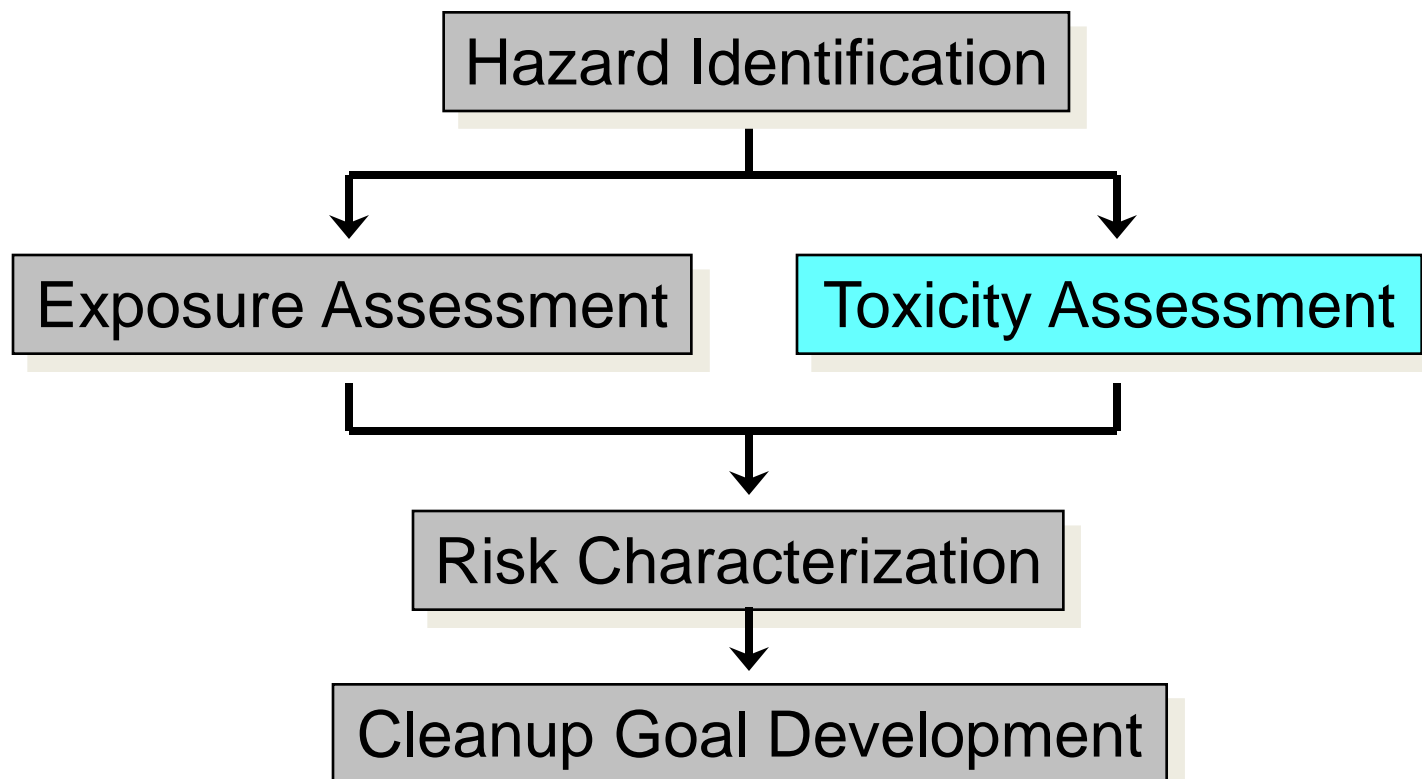


Exposure Assumptions

Exposure Factor	Residential Adult	Residential Child	Industrial/ Commercial
Body weight (kg)	70	15	70
Soil Ingestion rate (mg/day)	100	200	50/100
Inhalation rate (m ³ /day)	20	10	20
Skin Surface Area (cm)	5,700	2,800	3,300
Soil adherence factor (mg/cm ²)	0.07	0.2	0.2
Exposure Frequency (days/yr)	350	350	250
Exposure Duration (years)	24	6	25



Human Risk Assessment Process



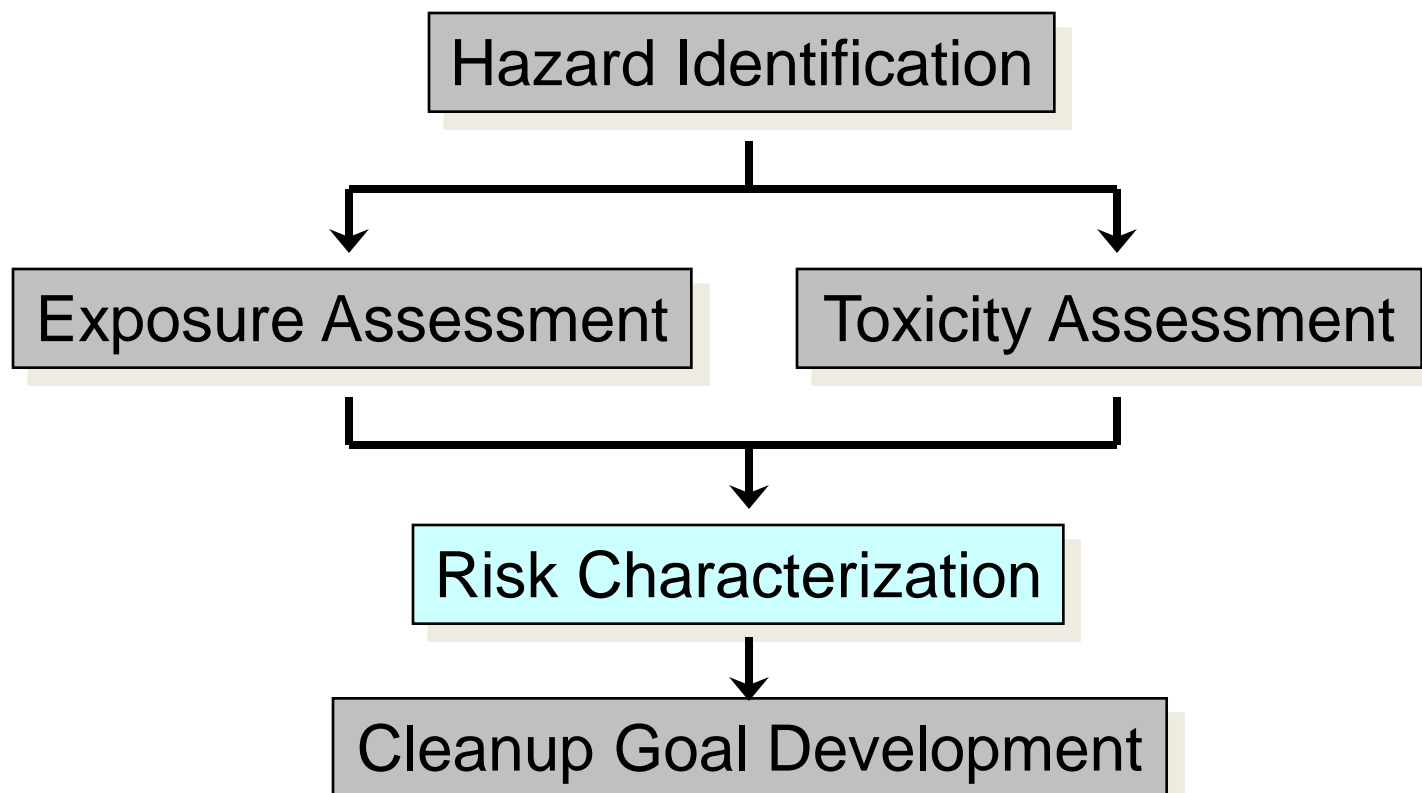


Toxicity Assessment

- Assessment of dose-specific effects from exposures
- Carcinogenic toxicity
 - Exposure has potential to result in cancer
 - Toxicity values described by a “cancer slope factor”
- Noncarcinogenic toxicity
 - Exposure above a threshold level could result in adverse effect
 - Toxicity values described by a “reference dose”



Human Risk Assessment Process





Risk Characterization

- Carcinogenic chemicals

$$\text{Risk} = (\text{Average Daily Dose})(\text{Cancer Slope Factor})$$

- Non-carcinogenic chemicals

$$\text{Hazard Quotient} = \frac{\text{Average Daily Dose}}{\text{Reference Dose}}$$

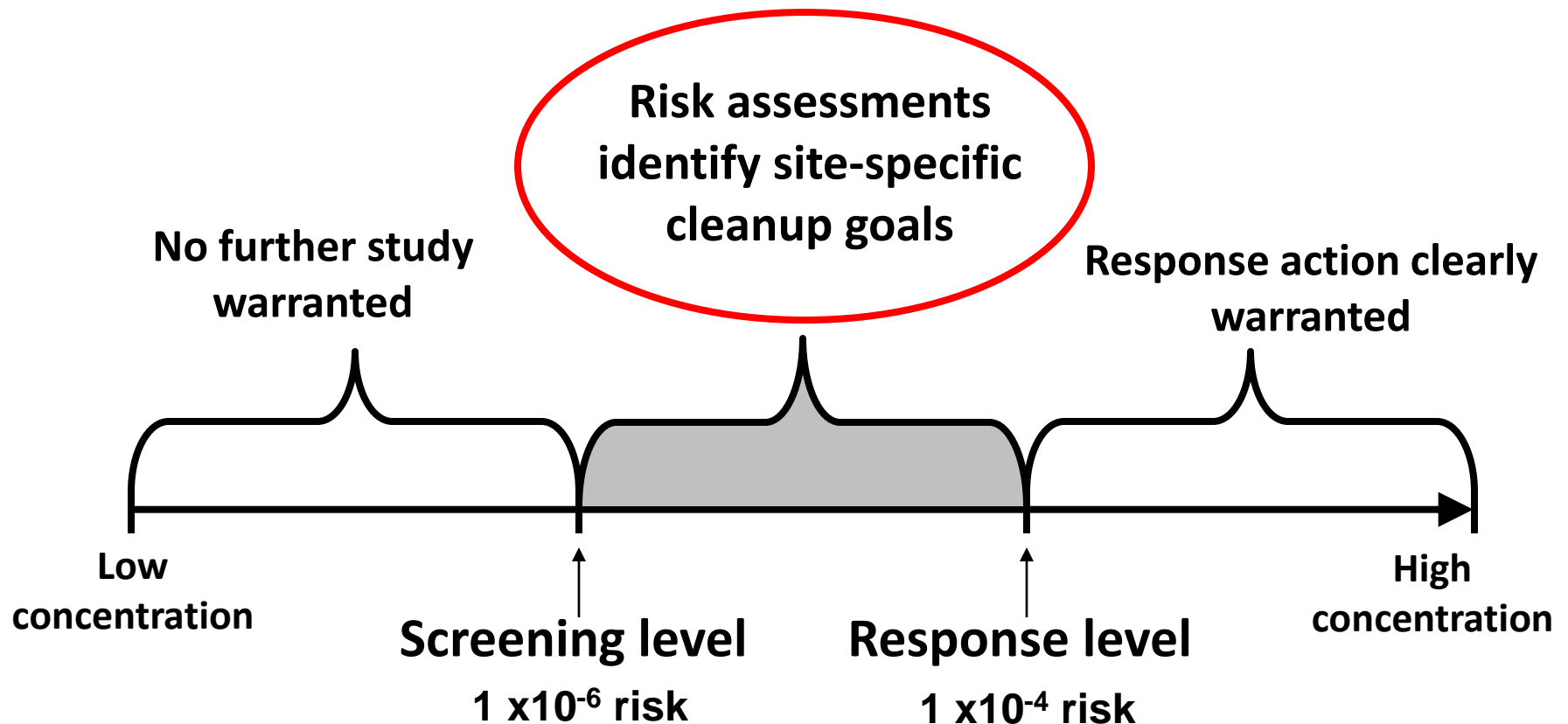


Risk Quantification

- Risk from all contaminants summed for each exposure pathway
- Risk is probability of cancer from exposure above risk from non-exposure
- General population cancer risk rate from all other causes is 1,000 to 100,000 times higher*:
$$(0.5 \text{ general risk}) + (0.0005 \text{ site risk}) = 0.5005 \text{ risk}$$



COPC Screening Levels





Cleanup Goals

- Developed only for COCs
 - COCs: a subset of COPCs driving cleanup
 - COPCs triggering cumulative risk $>10^{-4}$
 - COPCs triggering cumulative HI of 1.0
- Final COCs and remedial goals established in ROD



Risk Management

Goal – reduce contaminant concentrations at point of exposure to acceptable levels by:

- Removing source
- Treating and containing contamination
- Eliminating exposure pathways



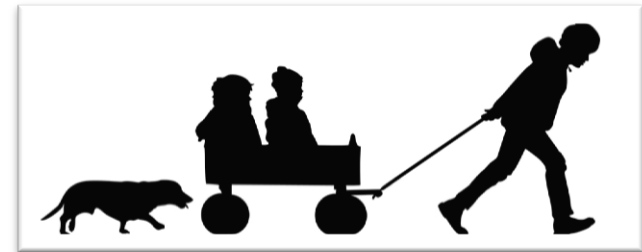
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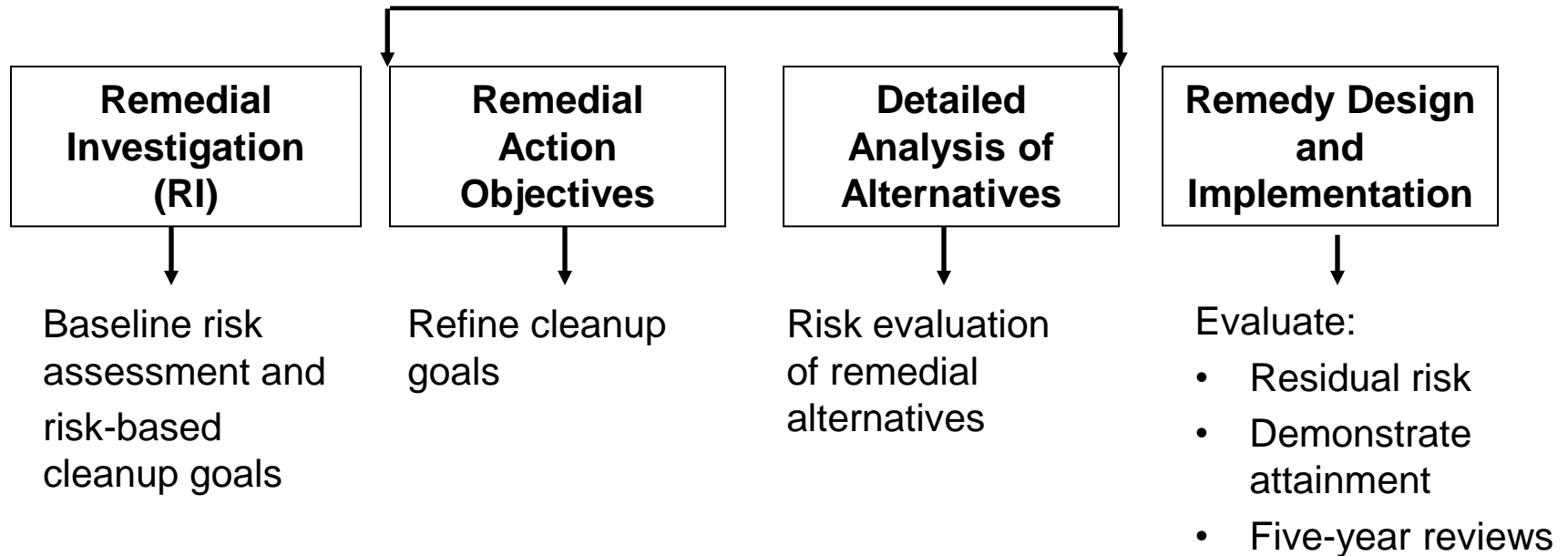


4. There are receptors (people, animals, a sensitive ecosystem)



Risk Assessment in Superfund

Feasibility Study





Questions?



Lead Cleanup Goals



Lead and Risk

- Risk assessment for lead is unique
- No established toxicity or acceptable dose
- Regulated based on biomarker: blood-lead levels (BLL)



EPA Approach to Lead

- Models assess routes of exposure and determine the distribution of lead among body tissues
- Children/Residential – Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK)
- Adults/Non-Residential – Adult Lead Model (ALM)



EPA Approach to Lead

- EPA considers BLL at or above 10 micrograms of lead per deciliter of blood ($\mu\text{g}/\text{dL}$) as risk to children
- IEUBK model predicts soil concentrations of 400 mg/kg to be safe for 10 $\mu\text{g}/\text{dL}$ BLL
- In 2012, CDC recommended 5 $\mu\text{g}/\text{dL}$ as level of concern for children



New CDC BLL

	5 $\mu\text{g/dL}$	10 $\mu\text{g/dL}$
<u>Based on Current Model Defaults</u>		
Residential Sites	153 mg/kg	418 mg/kg
<u>Based on Proposed Model Defaults</u>		
Residential Sites	162 mg/kg	599 mg/kg

Based on Current Model Defaults

Based on Proposed Model Defaults



IEUBK Model

- Links environmental lead exposure to BLL for children (0-7 years of age)

Exposure Component	calculates daily intake rate into the body from ingestion and inhalation of soil/dust, food, drinking water
Uptake Component	how much is actually absorbed in the body
Biokinetic Component	estimates transfer rates for lead moving between compartments and through elimination pathways to derive a predicted long-term steady state geometric mean BLL
Variability	estimates a plausible distribution of BLL for a given hypothetical population of known lead exposures



IEUBK Parameters

Media Concentrations	Soil	Site-specific data
	Dust	Site-specific data or derived from soil concentration using model assumptions
	Air (default)	Model default of 0.1 $\mu\text{g}/\text{m}^3$
	Drinking Water (default)	Model default 4 $\mu\text{g}/\text{L}$
Ingestion Rates	Soil/Dust	Model defaults recommended for each age group (ranging from 0 to 84 months)
	Diet	
	Ground Water	
Inhalation Rate	Soil/Dust	



Questions?



TASC Review of OU4 Plan



DePue CAG Concerns

1. OU4 Design Study and Pilot Study
2. “Bright-line” remedial goals
3. Sampling protocols
4. Lead cleanup levels
5. Arsenic cleanup levels



OU4 Design Study

- Superfund Accelerated Cleanup Model (SACM)
- Includes Presumptive Remedy to expedite planning process
 - excavation of soils
- Takes place of Remedial Investigation/Feasibility Study (RI/FS)



OU4 Design Study

- OU4 Design Study consistent with EPA guidance, but requires additions and revisions
- COPCs and bright-line goals identified appropriately
- Lacks explanation of decision-making process following sampling
 - IEPA recommended decision-making approaches in June 2012 letter

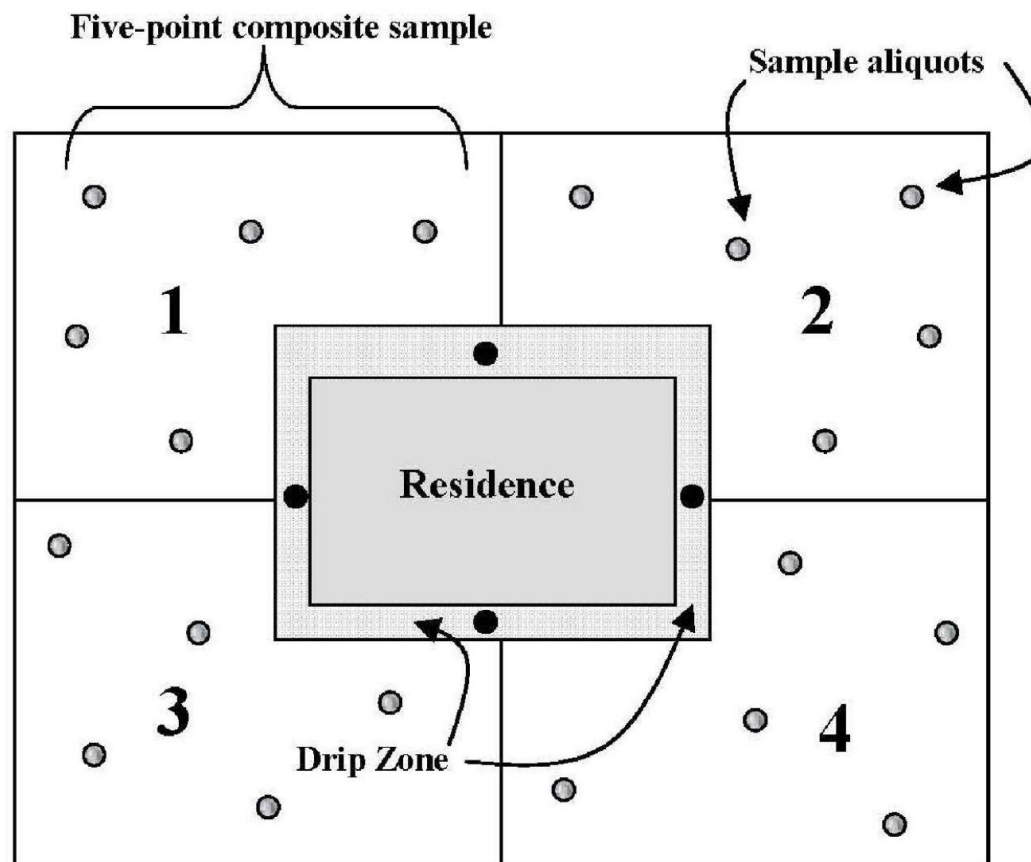


Soil Sampling

- IEPA approaches:
 1. Use of composite and discrete samples
 - Collect composite samples from each quadrant of yard
 - Discrete samples, depending results
 2. Use of discrete samples only
 - Sample every yard with a minimum of 10 discrete samples
- Confirmation sampling



Composite Sampling



SCENARIO 3: RECOMMENDED MINIMUM SOIL SAMPLING IN YARDS GREATER THAN 5,000 SQUARE FEET.



OU4 Pilot Study

- OU4 Pilot Study designed to expand understanding of extent of contamination
- Sampling of randomly selected subset of residential properties
- Data not yet available

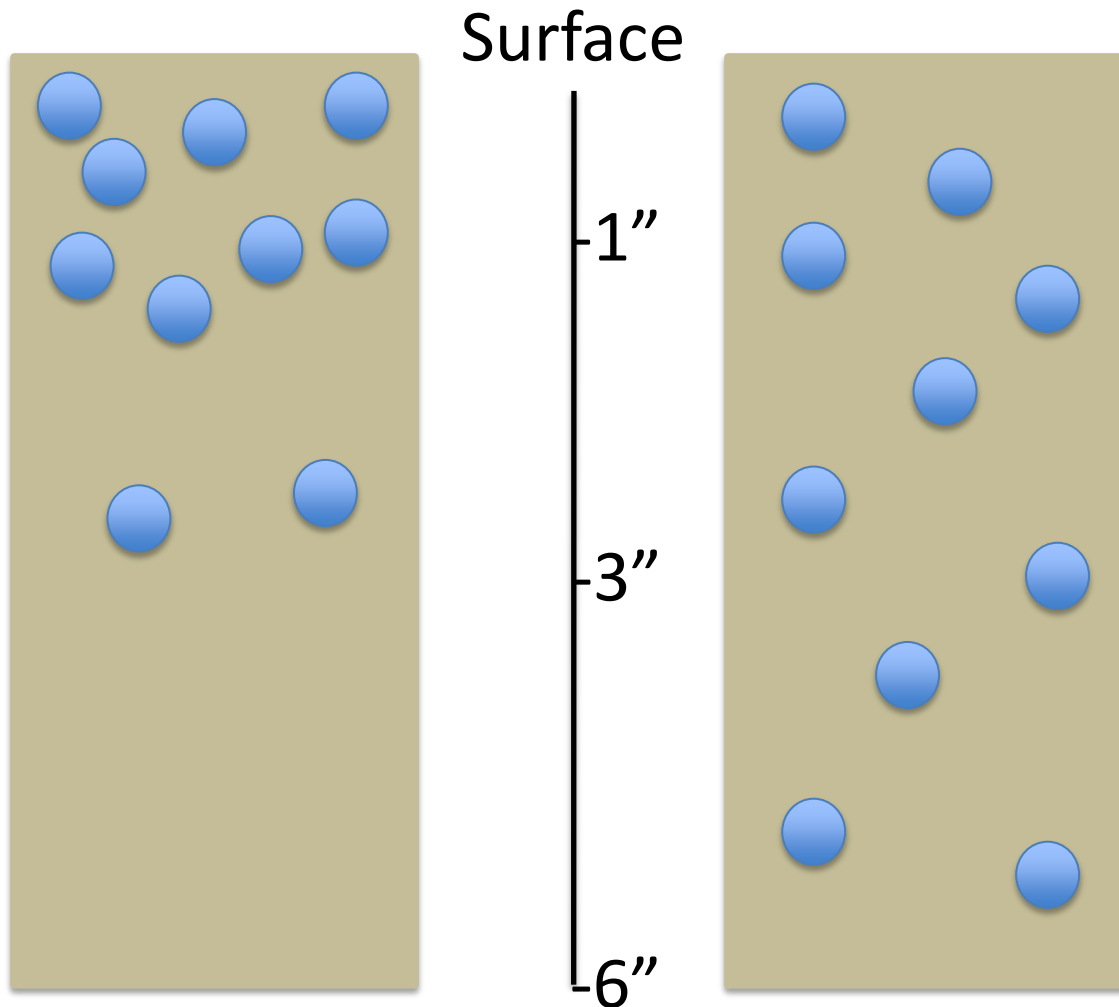


OU4 Pilot Study

- Statistical assessment of 0-1" deep and 1-6" deep soil concentrations
- If statistically not different, final plan will lump and collect 0-6" deep samples
- CAG may want to consider requesting that final plan retain 0-1" and 1-6" sample depths



Soil Sampling Depth





Lead Cleanup Levels

- Design Study lists 400 mg/kg
- IEPA requested RPs apply CDC's lower BLL
 - If applied, goal would be ~150-165 mg/kg
 - CDC BLL not yet adopted by EPA, but is under consideration
- CAG may want to consider supporting IEPA's recommendation to apply lower BLL to OU4 soils



Arsenic Cleanup Levels

- IEPA requires site cleanup to background concentrations
 - 11.6 mg/kg for DePue
- RPs proposed 20 mg/kg
- CAG may want to consider supporting IEPA's recommendation to clean up to background

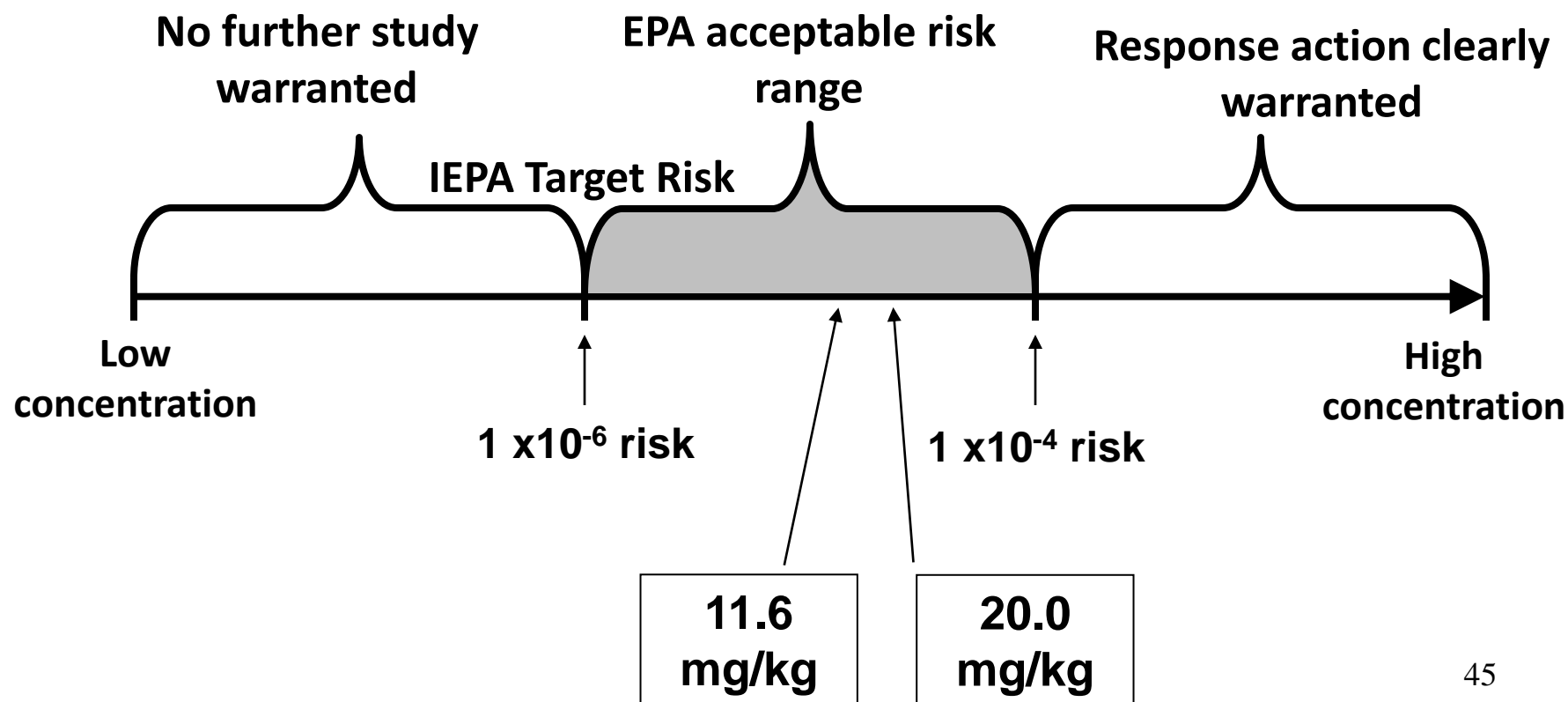


Arsenic Cleanup Levels

	IEPA-Proposed Background Levels	RP-Proposed Levels
Cleanup Level	11.6 mg/kg	20 mg/kg
Risk	1.90E-05	3.28E-05
Hazard Index	0.34	0.59



Arsenic Cleanup Levels





OU4 Next Steps

Pilot Study sampling data shared	Spring 2014
Design Study Work Plan	Spring 2014 finalization
Proposed Plan - Public comment period	Spring/Summer 2014
Record of Decision/Consent Order	Summer 2014
Design Study Implementation	Fall 2014



OU4 TASC Summary

- Design Plan requires additions and revisions
- CAG should consider:
 - Retaining the 0-1” soil sample depth in final design plan
 - Pursuing most stringent arsenic and lead cleanup goals
- CAG should review Pilot Study findings and final Design Plan



Questions?







Exposure Assessment

$$\text{Average Daily Dose (Intake)} = (\text{Chemical Concentration}) \frac{(\text{Ingestion Rate}) (\text{Exposure Duration}) (\text{Exposure Frequency})}{(\text{Body Weight}) (\text{Averaging Time})}$$

- Exposure parameters
 - Terms used to calculate an average daily intake or “dose” per chemical per media per receptor for a specific exposure time
- Exposure parameters vary per receptor
 - i.e.; for an adult the default exposure duration is 24 years, while for a child 6 years is commonly used



Pilot Study Objectives

- Obtain additional soil data to focus the full-scale soil investigation program,
- Determine the generalized depth of potential plant-related material,
- Determine if the lead concentration in the fine soil fraction is different from the lead concentration in the total sample,
- Determine if concentrations in the 0 to 1-inch soil samples are similar to concentrations in the 1 to 6-inch sample, thereby eliminating the need for collection of the 0 to 1-inch sample during implementation of the Design Study. If the data allow for eliminating the 0 to 1-inch sample interval, future sampling will be conducted from 0 to 6-inches,
- Determine the ability to refine the list of Human Health Constituents of Potential Concern (HCOPCs),
- Determine if chromium is present in the hexavalent or trivalent forms,
- Determine the adequacy of X-ray fluorescence (XRF) technology and define the terms of its use during implementation of the Design Study,
- Understand the likely scope of the full-scale soil remediation program,
- Gain experience with working in the community, and
- To evaluate the practicality of the assumptions and plans outlined in the Design Study.